

AMENDMENTS TO THE CLAIMS

Please amend claims 1, 3, and 15 as follows. The following listing of claims replaces all prior versions and listings of claims in this application:

1. (currently amended) A method to determine deployment level of an airbag in a vehicle, the method comprising the following steps:

(a) disposing in said vehicle a sensor system that emits optical energy toward a scene and includes an array of detection pixels in which each pixel captures three-dimensional depth information of a corresponding location of said scene using a reflected fraction of said emitted optical energy, each said pixel further capturing intensity of said reflected fraction of said emitted optical energy as well as capturing intensity of ambient optical energy, to repeatedly capture ~~repeatedly capturing~~ a plurality of frames of time-of-flight (TOF) three-dimensional depth images of a said scene, said scene including ~~that includes~~ a region of a seat in said vehicle, from which plurality of frames data representing occupancy of said seat may be determined with a confidence level greater than if data from a single frame were used; and

(b) repeatedly determining occupancy information using confidence enhancing plurality of frames captured at step (a), wherein determined said occupancy information is useable to determine deployment level to intelligently control deployment of said airbag. [1]

2. (previously presented) The method of claim 1, further including:

(c) upon receipt of an airbag-deployment triggering event, repeating at least portions of step (a) and step (b) more frequently than before occurrence of said airbag-deployment triggering event.

3. (currently amended) The method of claim 1, further including:

(d) determining airbag deployment level based at least in part on occupancy data captured during at least one of (i) most recently acquired occupancy data captured before occurrence of an airbag-deployment triggering event, and (ii) occupancy data

captured immediately after occurrence of an airbag-deployment triggering event;

wherein such airbag deployment level determination is useable to intelligently control deployment of said airbag.

4. (previously presented) The method of claim 1, further including:

(c) upon receipt of an airbag-deployment triggering event, repeating at least portions of step (a) and step (b) more frequently than before identification of occurrence of said airbag-deployment triggering event; and

(d) determining airbag deployment level based at least in part on occupancy data captured after occurrence of an airbag-deployment triggering event;

wherein such airbag deployment level determination is useable to intelligently control deployment of said airbag.

5. (previously presented) The method of claim 1, wherein step (b) includes at least one procedure selected from a group consisting of (i) using a hierarchical layered determination method, and (ii) using a training algorithm.

6. (previously presented) The method of claim 1, wherein step (b) includes at least one determination selected from a group consisting of (i) determining position information of an occupant of said seat, (ii) determining position information of an occupant of said seat relative to a region from which said airbag is deployable, (iii) determining position information of at least one body portion of an occupant of said seat, (iv) determining position information of at least one body portion of an occupant of said seat relative to a region from which said airbag is deployable, (v) determining a pose of an occupant of said seat; and (vi) determining whether an extremity of said occupant of said seat extends towards a region from which said airbag is deployable.

7. (previously presented) The method of claim 1, further including at least one occupant classification selected from a group consisting of (i) classifying an occupant of said seat, (ii) classifying an occupant of said seat before occurrence of an airbag-

deployment triggering event, (iii) classifying an occupant of said seat immediately upon start-up of said vehicle.

8. (previously presented) The method of claim 1, wherein step (b) includes a training algorithm selected from a group consisting of (i) a nearest neighbor classifier, (ii) a support vector machine, (iii) a neural network, and (iv) a linear discriminant analyzer.

9. (previously presented) The method of claim 1, wherein step (a) includes capturing at least one depth image with lower resolution than resolution used before occurrence of an airbag-deployment triggering event.

10. (previously presented) The method of claim 1, further including determining deployment level in a manner selected from a group consisting of (i) lowering deployment level when said occupant is less than a minimum distance from a region from which said airbag is deployable.

11. (previously presented) The method of claim 2, wherein step (c) includes processing input from at least one sensor that signals occurrence of a collision involving said vehicle.

12. (previously presented) The method of claim 1, wherein intelligent deployment of said airbag includes deployment selected from a group consisting of (i) mandatory deployment, (ii) deployment at reduced power, (iii) non-deployment, and (iv) unconditional non-deployment.

13. (previously presented) The method of claim 1, wherein step (a) includes acquiring from at least a region of said scene at least one of (i) depth map information, (ii) reflectivity-based intensity information, and (iii) intensity-based information.

14. (previously presented) The method of claim 1, further including disabling

airbag deployment when at least a portion of said occupant is determined to be too close to a region from which said airbag is deployable.

15. (currently amended) A three-dimension time-of-flight (TOF) sensor system to determine deployment level of an airbag in a vehicle, the sensor system deployable within said vehicle and comprising:

a light source to emit light onto a scene that includes a region of a seat in said vehicle seat protectable by said airbag;

a sensor array of detection pixels disposed such that each pixel captures three-dimensional depth information of a corresponding location of said scene using a reflected fraction of emitted light from said light source, each said pixel further capturing intensity of said reflected fraction of emitted light as well as capturing intensity of ambient light, said sensor array; ~~disposed to capture light reflected from said scene including reflected said emitted light from said light source;~~

means for repeatedly capturing a plurality of frames of time-of-flight (TOF) three-dimensional depth images of said scene from said sensor array, from which plurality of frames data representing occupancy of said seat may be determined with a confidence level greater than if data from a single frame were used; and

means for repeatedly determining occupancy information using confidence enhancing plurality of frames captured by said sensor array, wherein determined said occupancy information is useable to determine deployment level to intelligently control deployment of said airbag.

16. (previously presented) The sensor system of claim 15, wherein upon receipt of an airbag-deployment triggering event, said means for repeatedly capturing captures more frequently and said means for repeatedly determining determines more frequently than before occurrence of said airbag-deployment triggering event.

17. (previously presented) The sensor system of claim 15, wherein upon occurrence of an airbag-deployment triggering event, airbag deployment level is determined based at least in part on occupancy data captured after occurrence of an

airbag-deployment triggering event;

wherein airbag deployment level determination is useable to intelligently control deployment of said airbag.

18. (previously presented) The sensor system of claim 15, wherein upon occurrence of an airbag-deployment triggering event,

said means for repeatedly capturing captures more frequently and said means for repeatedly determining determines more frequently than before occurrence of said airbag-deployment triggering event; and

airbag deployment level is determined based at least in part on occupancy data captured after occurrence of an airbag-deployment triggering event; [;]

wherein airbag deployment level determination is useable to intelligently control deployment of said airbag.

19. (previously presented) The sensor system of claim 15, wherein said means for determining includes at least one procedure selected from a group consisting of (i) a hierarchical layered determination, and (ii) a training algorithm.

20. (previously presented) The sensor system of claim 15, wherein said means for repeatedly determining carries out at least one determination selected from a group consisting of (i) determining position information of an occupant of said seat, (ii) determining position information of an occupant of said seat relative to a region from which said airbag is deployable, (iii) determining position information of at least one body portion of an occupant of said seat, (iv) determining position information of at least one body portion of an occupant of said seat relative to a region from which said airbag is deployable, (v) determining a pose of an occupant of said seat; and (vi) determining whether an extremity of said occupant of said seat extends towards a region from which said airbag is deployable.

21. (previously presented) The sensor system of claim 15, wherein occupant classification includes at least one classification selected from a group consisting of (i)

classifying an occupant of said seat, (ii) classifying an occupant of said seat before occurrence of an airbag-deployment triggering event, (iii) classifying an occupant of said seat immediately upon start-up of said vehicle.

22. (previously presented) The sensor system of claim 15, said means for determining includes at least one training algorithm selected from a group consisting of (i) a nearest neighbor classifier, (ii) a support vector machine, (iii) a neural network, and (iv) a linear discriminant analyzer.

23. (previously presented) The sensor system of claim 15, wherein said means for repeatedly capturing captures at least one depth image with lower resolution than resolution used before occurrence of an airbag-deployment triggering event.

24. (previously presented) The sensor system of claim 15, wherein airbag deployment level is determined in a manner selected from a group consisting of (i) lowering deployment level when said occupant is less than a minimum distance from a region from which said airbag is deployable, and (ii) maximizing deployment level when said occupant is a maximum distance from a region from which said airbag is deployable.

25. (previously presented) The sensor system of claim 15, further including at least one sensor that signals occurrence of a collision involving said vehicle, output from said at least one sensor being processed to identify occurrence of an airbag-deployment triggering event.

26. (previously presented) The sensor system of claim 15, wherein said means for determining intelligent deployment of said airbag includes deployment selected from a group consisting of (i) mandatory deployment, (ii) deployment at reduced power, (iii) non-deployment, and (iv) unconditional non-deployment.

27. (previously presented) The sensor system of claim 15, wherein said means for repeatedly capturing acquires from at least a region of said scene at least one of (i)

depth map information, (ii) reflectivity-based intensity information, and (iii) intensity-based information.

28. (previously presented) The sensor system of claim 15, further including disabling airbag deployment when at least a portion of said occupant is determined to be too close to a region from which said airbag is deployable.

29. (previously presented) The sensor system of claim 15, wherein said-means for determining includes a training algorithm selected from a group consisting of (i) a nearest neighbor classifier, (ii) a support vector machine, (iii) a neural network, and (iv) a linear discriminant analyzer.

30. (previously presented) The sensor system of claim 15, wherein said system determines whether an image contains a face of a passenger in said seat.

31. (previously presented) The sensor system of claim 15, wherein at least a portion of said system operates under control of a processor.